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 Department: MBBS  
 Course: Chemistry 102

Assignment

Q1 Give the IUPAC names of the following compounds  
Soln

- i)  $\text{HCOOH} \rightarrow$  Methanoic acid
- ii)  $\text{HOOCCH}_2\text{CH}_2\text{CH}_2\text{COOH} \rightarrow$  Pentan-1,5-dioic acid
- iii)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH} \rightarrow$  Butanoic acid
- iv)  $\text{HO}_2\text{C}-\text{CO}_2\text{H} \rightarrow$  Ethanedioic acid
- v)  $\text{CH}_3(\text{CCH}_2)_4\text{COOH} \rightarrow$  Hexanoic acid
- vi)  $\text{CH}_3\text{CH}=\text{CHCH}_2\text{CH}_2\text{COOH} \rightarrow$  Hex-4-enoic acid

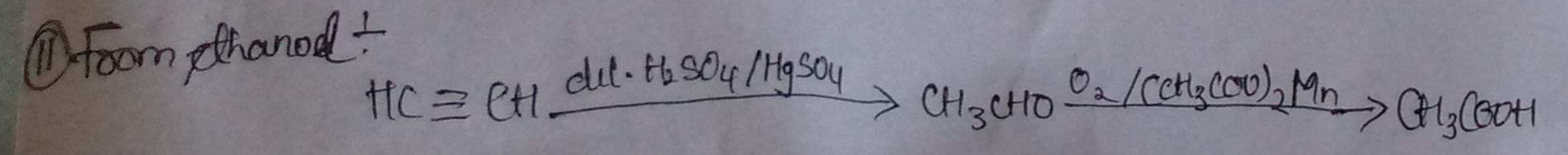
Q2 Discuss briefly the physical properties of carboxylic acid under the following headings

Soln

- i) Physical appearance: All simple aliphatic carboxylic acids up to  $\text{C}_{10}$  are liquids at room temperature. Most are solid at room temperature although anhydrous carboxylic acid (acetic acid) also known as glacial ethanoic acid freezes below the room temperature.
- ii) Boiling point: It increases with increasing relative molecular mass. Aromatic carboxylic acids are crystalline solids and have higher melting points than their aliphatic counterparts of comparable relative molecular mass.
- iii) Solubility: All carboxylic acids are soluble in organic solvents. The water solubility of the acids decreases as the relative molecular mass increases because the structure becomes relatively more hydrocarbon in nature and hence covalent.

Q3 Write two industrial preparations of carboxylic acids  
Soln

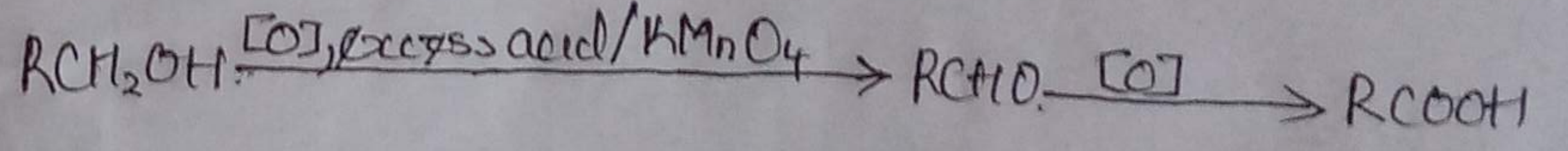
i) From petroleum: Liquid phase air oxidation of  $\text{C}_5-\text{C}_7$  alkanes, obtainable from petroleum at high temperature and pressure will give  $\text{C}_5-\text{C}_7$  carboxylic acids with methanoic, propanoic and butanoic acids as by-products.



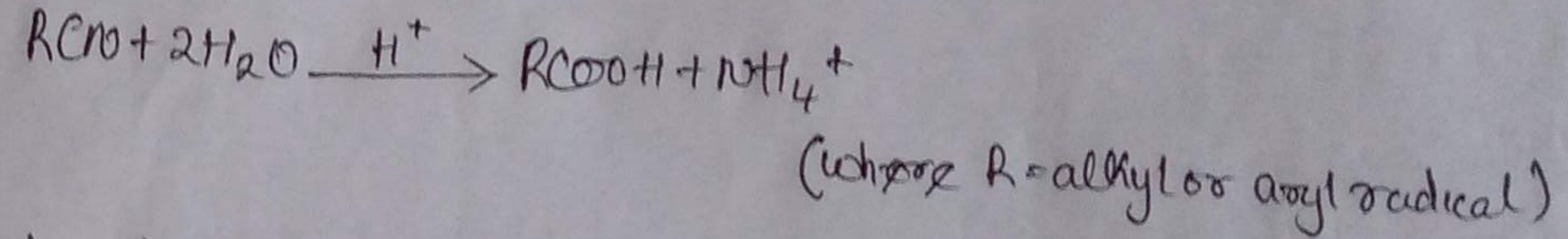
Q4 With equations and brief explanation discuss the synthetic preparation of carboxylic acids.

Soln

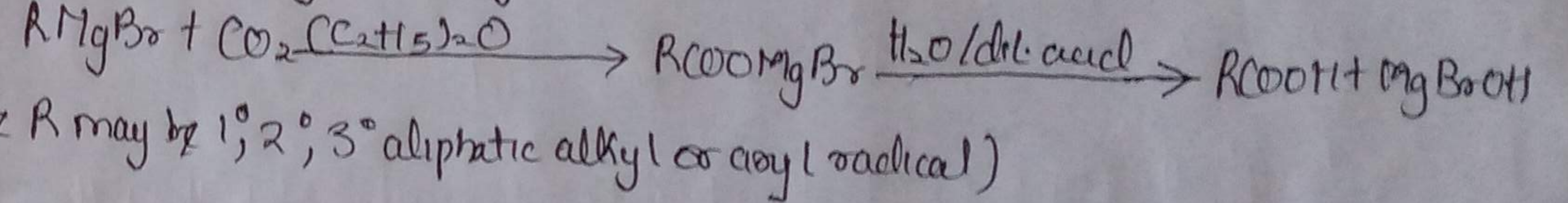
i) Oxidation of primary alcohols and aldehydes: Using the usual oxidizing agents in acidic solution



ii) Hydrolysis of nitriles (cyanides) or esters:



iii) Carbonation of Grignard reagent:

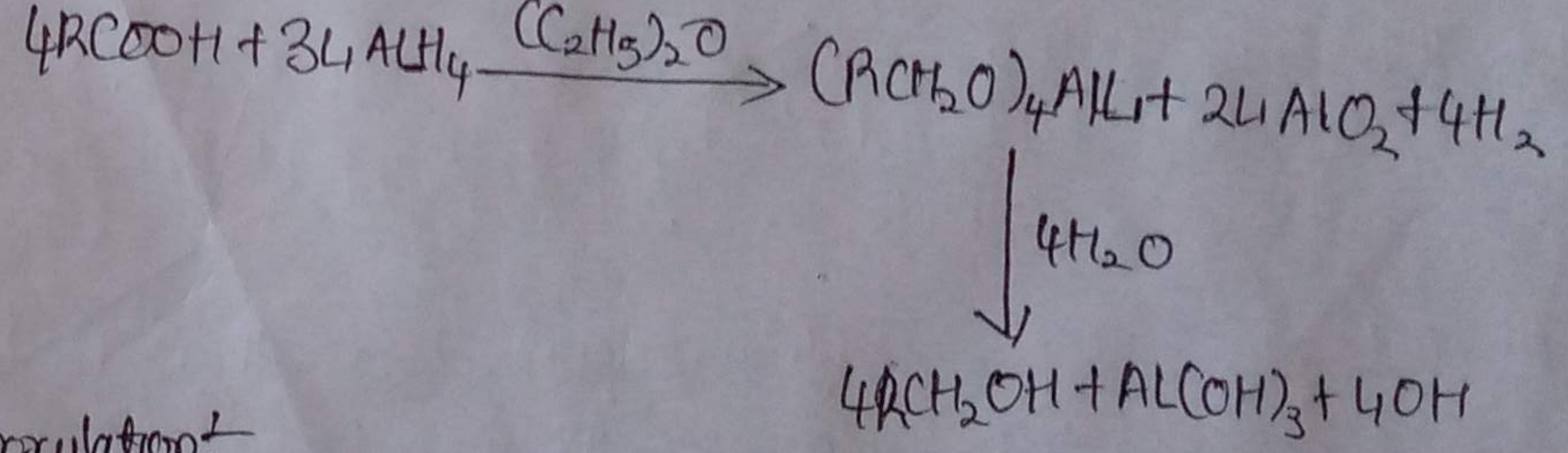


Q5 With chemical equations only, outline the reduction, decarboxylation and esterification of carboxylic acids

Soln

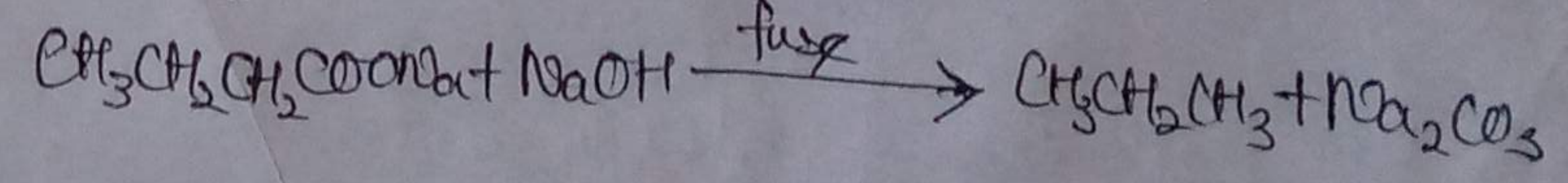
i) Reduction:

ii) Lithium tri-tert-butoxyaluminum hydride (LTH) and diborane:



iii) Decarboxylation:

a) Thermal decarboxylation:



iii) Esterification

a) Presence of strong acid catalyst:

